

NAVIGATION

IMPROVED:

O R,

Some NEW and EASY

INVENTIONS

To find

A SHIP's True COURSE always,

A SHIP's LATITUDE at any Hour;

AND THE

LONGITUDE at SEA:

Never before disclosed,

WITH

A DISCOURSE on the great Advantage of such Contrivances to the TRADE and REVENUES of *England*, and the *British* Dominions.

AND A

LETTER to the *ROYAL SOCIETY*.

L O N D O N:

Printed for T. COOPER, at the *Globe* in *Pater-Noster-Row*. 1741.

NAVIGATION

IMPROVED:

OR

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INSTRUCTIONS



Always

A SHIP

AND THE

LONGITUDE at SEA:

Never before disclosed.

WITH

A DISCOURSE on the great Advantages of such Contrivances to the TRADE and REVENUES of England, and the West-India Dominions.

AND A

LETTER to the ROYAL SOCIETY.

LONDON:

Printed for T. Cooper, at the Golden Ball, in Pall-mall.



DEDICATION TO THE PUBLIC.



WHAT is for the public Good, ought to be the public Concern: This makes you proper People to dedicate this Work to. Every Man in the Kingdom, is, in some Sense or other, concerned in the Prosperity and Success of its Trade. Our Trade depends upon our Navigation and Intercourse with other Countries, and our Riches arise from the Advantage of our Commerce with them. If the Goods we manufacture

facture or trade in, could not be conveyed to Markets abroad, there would be an End to labour, and a Beginning to Poverty! We must then live one upon another, and the Fruits of this small Spot of Land we inhabit; whereas our Trade brings to us the choicest Products and Treasures of all the World. Our Ships are the Vehicles to transport to us, what other Countries contribute, to make us happy and powerful; and we are sufficiently so in our Riches, and Number to defend ourselves against all Foreign Enemies, and avoid falling a Prey to their Invasions; which, were we an indigent, and unemployed Nation, we should always be exposed to.

Our Navigation and Trade abroad, being then the Foundation of so many Blessings, what of temporal Things ought we to be more careful and anxious about? What would be our Concern for Property, if we had Nothing to lose? How useless and ridiculous would become our Zeal for Liberty, when we had no Enjoyment left to be free in? Without this Foreign Trade, which takes off such large Quantities of our
Manu-

Manufactures and Products, and affords Subsistence and Wealth to Thousands, what would be the Use of Government and Laws, unless to prevent the Attacks of Wretches grown desperate by Necessity, upon their rich Neighbours? for, suppose three Parts in four of our working People had no Employment, what else could be the Effects of their Hunger, but Rapine?

Thus stands the Importance of our Navigation, which has raised us from a poor and defenceless Condition, to that Power and Dignity, which is our Glory and our Safety: And should this Fountain of so much Happiness be stopped, or even abated, and recur to our Neighbours, we must by Degrees be necessarily reduced to such a deplorable Condition before-mentioned; for that Society or Nation that always increases in Riches, will render others that increase not so fast, still poorer. Admit me to imagine, that by some Casualty or Change in Nature and the Atmosphere, the Winds, which are now variable, were to set all the Year one Way, as do the Trade-winds between the Tropics; were it al-

ways westerly, none of our Ships bound any where to the Westward, could stir upon their Voyage, and those bound to the Eastward could not return Home; and when we had lost our Eastward and Westward Trade, what must become of us? How apt should we be then to caress the Man who could instruct us to carry our Ships out against the Wind.

Or, if this was only the Case, that our Ships should frequently lie wind-bound, as have happened often for three Months together; and should our Neighbours never wait three Days for a Wind, every body must judge, that they would by that Advantage supplant us in all Foreign Markets, and soon destroy our Trade in general, and then us, if they should think fit, which would make such an Invention dearly prized.

Now though our Trade abroad is under none of the Circumstances I have supposed, and hope never can be, we have the Seas open, and variable Winds to suit our different Purposes; and we have our Fleets and the Art of conducting them

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them a-cross the Seas, yet Navigation wants a great many Helps to make it perfect, and more secure and advantageous: And if there be any Obstructions on this Part, upon which the Existence of our Trade so much depends, I believe every thinking Man in the Kingdom would be pleased to see an Expedient to remove them.

I shall consider and explain the Defects Navigation labours under, in the clearest Manner I can; for the Use of such, who are Strangers to the Subject; and tho' it is an Affair that seems the least regarded among the Business of the Nation, yet I believe it will appear, that Nothing deserves more Notice, for the Advancement of its Trade.

The Thing called the *Longitude*, or a Way to find it out at Sea, has been contemptibly looked upon by the Generality of People, as if it carried in its self some Contradiction or Impossibility; and the Reward has tempted several ignorant Persons, and some unsuccessful ones, to add to the Ridicule of it; and without Doubt this has deterred many ingenious

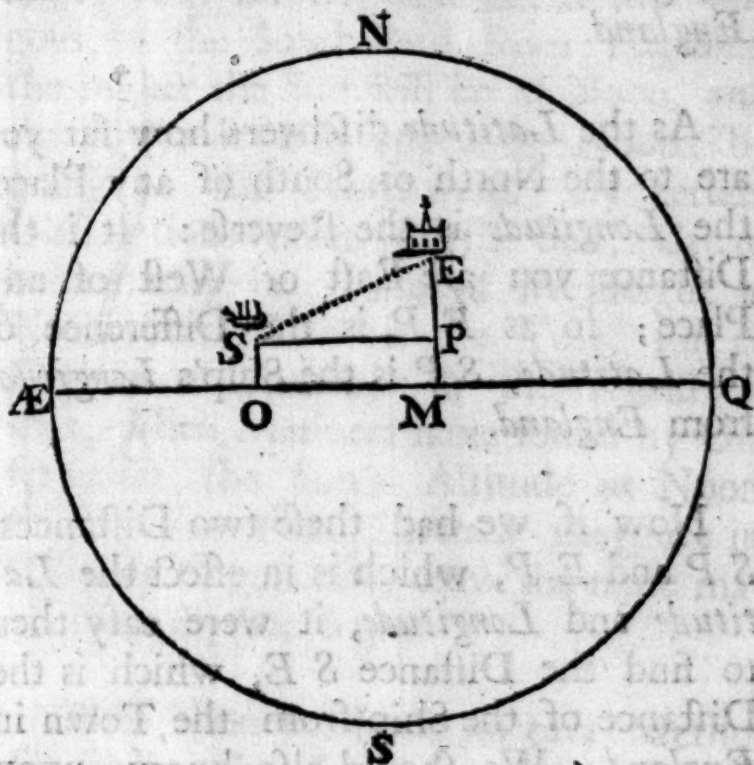
ingenious Capacities from offering any Thing useful to the Discovery.

This wrong Judgment proceeds in some from an Ignorance of what the Thing wanted really is; and, in others, from not duly considering it: I shall therefore in the first place explain the Meaning of the *Longitude*, and its Uses at Sea,

There are two Parts of Navigation, besides the Use of the Compass, such, that without a Knowledge of one of them, no Voyages would be ventured out of Sight of Land; for Ships would miss their Way, and be left on the wide Ocean, as a Man might be in a Desert. These two Parts are the *Latitude* and the *Longitude*; The *Latitude* is discovered by certain Methods made Use of by all Mariners: It is the Distance of any Place or Station, North or South, from the Middle of the World; or the Distance you are from the Equinoctial Line, which is described in all Maps of the World.

Now

Now if we know what is the *Latitude* of any Part of *England*, and what *Latitude* a Ship is in at Sea, the Difference of those two *Latitudes* is what the Ship is to the North or South of that Part of *England*. It is more particularly described thus:



A E N Q S is the Globe of the World;
N the North Point, *S* the South Point,
E Q the *Æquator* or *Equinoctial* Line;

an

(8)
an imaginary Line, which divides the Earth equally between the North and the South Points. Suppose *E* to be a Town in *England*, *S* a Ship at Sea; the Number of Leagues between *E* and *M* is the *Latitude* of the Town, and *S O* the *Latitude* of the Ship, *E P* is the Difference of the *Latitude*; so that the Ship is the Length of *E P* more to the South than *England*.

As the *Latitude* discovers how far you are to the North or South of any Place, the *Longitude* is the Reverse: It is the Distance you are East or West of any Place; so as *E P* is the Difference of the *Latitude*, *S P* is the Ship's *Longitude* from *England*.

Now if we had these two Distances, *S P* and *E P*; which is in effect the *Latitude* and *Longitude*, it were easy then to find the Distance *S E*, which is the Distance of the Ship from the Town in *England*. We should also know, upon what Point of the Compass the Town stood from the Ship, by which it would be known how to steer for it by Day and by Night, as well as if it were in Sight.

But

But our Misfortune is to know but one of these important Expedients, that is, the finding the *Latitude*. There is an infallible Method for that at Sea, but not the *Longitude*; Seamen find their *Latitude* by Observations of the Sun, Moon or Stars, but generally by the Sun: Every body knows, that the farther one goes to the Southward from *England*, the higher the Sun will be at Noon, and the lower it will appear at Noon; by going to the Northward. By certain Observations taken of the Sun, Calculations may be made of its Height at Noon every Day in the Year, for all Degrees of *Latitude* in the World; so that, when Mariners have found by Observation the Sun's Altitude at Noon, they know what *Latitude* they are in. It is easy to conceive, how the same may be done by the Stars.

Thus Nature affords an easy Method for finding the *Latitude* at Sea; and if any of the Stars were deprived of their Motion of rising and setting, and became fixed in one Place in the Heavens, or were there any other immoveable

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Object,

Object, the *Longitude* would be found in the same Manner, as is the *Latitude*.

Divers Methods have been proposed to accomplish this Work; some have proposed a Machine, in the Nature of a Clock, to keep Time without Error; and for that Purpose wild Notions have been conceived of a perpetual Motion: If such a Machine could be effected, the *Longitude* would be very truly discovered; but if it should lose, or get in a Voyage one Hour, it would make an Error in the *Longitude* of a Ship nine hundred Miles, and so in Proportion to a greater or less Time; which is too much to be trusted to any Machine.

There are certain Motions of the Moon and some Stars, which have been proposed to find the *Longitude* by, but they have not been rendered yet either sufficient in themselves, or practicable in the Motion of a Ship at Sea. Upon Land the Observation of Eclipses of the Sun, Moon and some Planets will shew the *Longitude* very near the Truth; and are the Means by which
Geographers

(11)
Geographers settle the *Longitude* of all Countries:

The Discovery of the *Longitude* is not then that Absurdity it is by many taken for, since there are Methods effectual for it on Shore; and what Improvements may be made of them, or what farther Discoveries for the Sea Service, we know not.

But besides all the Methods I have spoken of for obtaining the *Longitude*, there is one actually in practice with Seamen; and, tho' not perfect, yet is of great Service to them; and sometimes falls out so true, that in a Voyage of five hundred Leagues, they do not err above ten.

The Sailors of some Countries judge of the Motion the Ship makes, by observing the Water as she sails thro' it: The *English* make Use of a small Board called the *Log*, which being thrown over Board with a Line fastened to it, stops in the Water, while the Line runs out upon a Reel in the Ship, as she sails from it: They observe, by a Minute,

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or Half-minute Glass, what Length of Line runs out in that Time; and by that Means find how fast the Ship goes.

Then knowing how fast a Ship goes, and the Course she steers, by an easy Rule may be found both her *Latitude* and *Longitude*; and, was this Method certain, it would be far preferable to any yet proposed; for it would give the *Latitude* and *Longitude* at all Times; whereas a Ship may be several Days without an Observation of the Sun, Moon or Stars.

But this Method of the *Log*, as it is now used, is so imperfect, that tho' it sometimes answers to an Exactness by Accident, it will err at other Times in a Voyage between *England* and *America* an hundred Leagues.

By this Uncertainty Ships miss their Course, and are often lost; for, suppose a Ship, by her reckoning, is not within an hundred Leagues of the Port she is bound to, the Master, tho' a prudent Sailor, might venture to sail boldly on, and

and in the Night, or close Weather, falls unexpectedly upon Rocks or Sands; and this is known to have been the Fate of many Ships.

If the Error lies on the other Side, so that a Ship's Reckoning is out an hundred Leagues before she reaches the Land, it puts the Mariners in a great Perplexity; for, if they have no Observation to find their *Latitude*, they run on by guess, untill they find the Land; in which Circumstance they are exposed to very great Dangers; for, when a Man knows not where he is, he knows not what Dangers are near him; and, of Consequence, not how to shun them. This is the Danger, besides the Loss of Time in the Voyage, which is an unknown Detriment to the Merchant.

The melancholy Loss of Sir CLOUDESLEY SHOVEL, and such a Number of useful Lives, who suffered all in one Fate, was owing to a Mistake in their Navigation. He reckoned himself at a considerable Distance at Sea, when he was, in Truth, very near the Shore, and
in

in the Night fell among a Multitude of dreadful Rocks, where many hundreds with their Admiral lamentably perished; and it was by a special Providence, that the whole Fleet, and every Soul had not come to the same End. The Ships there lost, had stood the Nation in a vast Sum of Money. They were arrived just upon the Coast of their native Country, where they expected their Ease and Safety, after all the Toils and Dangers they had bravely encountered against their Enemies, and there laid down their Lives. The Hopes of all their Friends were deceived; instead of the welcome Tidings of their Arrival, they received the bitterest Occasion of Sorrow and Lamentation for their untimely Loss. It was a Shock the whole Nation had Cause to feel, not only for the Deprivation of such a Part of their Naval Strength, but upon the sad Reflection of losing those Lives at Home, which no Enemy could take from them abroad; and that all their Success and Glory fell a Sacrifice to the Defects of Navigation; and God knows how soon such another dismal Instance, or a worse may happen to us.

But

But notwithstanding this Accident, and what happens frequently to unfortunate Ships, yet this Part of Navigation seems to have been looked upon as too trivial to be taken Notice of among other public Advantages to the Kingdom. The Affair, it is likely, has suffered in this Respect, for Want of Friends and Motives to engage a proper Attention to it. How far those whose Province it is, may think it incumbent on them to shew Favour and Encouragement to Things of this Kind, I know not; but I know this, that if a single Man has any Thing to propose for the Benefit of twenty Millions of People, he may as properly expect to be solicited, as to sollicite concerning it.

What early Care and Encouragement such Inventions require, to bring them to Perfection, is very obvious: In Searches after unknown Things, a Dawning of them is commonly first obtained, and by proceeding they at length discover themselves in their perfect Shape; but should these first Appearances be lost, they might never be recovered.

The

The Public ought to be informed of the Nature and Value of Discoveries so generally useful; and your Interest is materially concerned, that no Proposal of any Merit should be rejected: Proposals for the Advancement of Navigation are for the Advancement of your Trade and Wealth: If Merchants were to run less Hazards, and to be at less Charges in their Ships Voyages, they would be enabled to carry on a greater Trade, and transport more of your Products and Manufactures to the general Advantage of the Kingdom: Your Taxes must be less, when the Navy of the Kingdom becomes less expensive, by being more secure; and the Revenues increase of themselves by saving those Duties of Goods, which are lost with the Ships they are in, and by an Enlargement of the Trade of the Nation. Your Benefit in such plain Acquisitions as these, is intrinsically as valuable to you, as what proceeds from many of splendid Titles: It is a positive Benefit to you, the same as a new Country or a new Trade obtained; and therefore you are deprived of good Chances, by the

the suffering the Sparks of any Inventions, tending to such Usefulness, to expire, or in their Infancy to starve (of which there have been Instances) in Hands too nice or courtly to raise them.

Admit me to consider the Advantages the *British Dominions* may possibly receive from an Invention for finding the *Longitude* at Sea, in Regard to the Safety and Expedition of Voyages, by a few Suppositions.

Suppose there are belonging to *London*, one Year with another, 6000 Ships and Cargoes of all Sorts; and, take one with another, they and their several Ladings in a Year worth 5000*l.* each: This Estimation, considering the Value of *India*, and other Companys Ships, and the Number of Voyages small ones make in a Year, may not be thought too great; why then *London* ventures upon the Seas every Year 30 Millions of Money, or its Value; I will state it thus, for that and other Places;

D

London

London Merchants — — — — — } 30,000,000

King's Ships, Yatches, &c.
that are abroad, in a } 2,000,000
Year's Time worth

Newcastle, Hull, Yarmouth,
and all the Ports on the } 5,000,000
Eastern Coast of Eng-
land — — — — — }

Dover, Chichester, &c. to }
the Land's-End — — — — — } 2,000,000

Bristol, and all the Ports }
in the Bristol Channel } 3,000,000

Whitehaven, Lancaster, Li-
verpoole, Chester, and all } 3,000,000
the Ports to Milford — — — — — }

The Sea Ports of all Scot-
land — — — — — } 12,000,000

The Sea Ports of all Ire-
land — — — — — } 12,000,000

69,000,000

Guernsey,

(19)

Brought over — — — 69,000,000

Guernsey, Jersey, Caribbee,
and Leeward Islands, }
Newfoundland, and all } 5,000,000
other Islands — — }

New-England, Virginia, }
and all our Settlements } 3,000,000
on the Continent of }
America — — }

77,000,000

I should be apt to guess, that among all the foreign Trade of our great Companies, our private Merchants and our coasting Trade, that not less than 80 Millions of Money is turned in a Year in all the King's Dominions: But suppose it 77 Millions, the Insurance of that in twelve Months Sailing, would not cost less than 8 *per Cent.* in Time of Peace; for a Coaster that pays but 20 *per Cent.* Premium, will make four Voyages in a Year; and crossing the Seas

D 2

thereby

thereby 8 Times, makes 8 *l. per Cent.*
per Annum.

Now if the Discovery of the *Longitude* should render Voyages as safe again, the Insurance would be worth but half as much as it is; and four *per Cent.* would be saved in 77 Millions a Year, which amounts to three Millions and eighty Thousand Pounds a Year.

And suppose, in the Expedition of Voyages, Ships were to gain by the *Longitude* one Month in the Year; and, that the Profits arising from our Navigation to *England*, and all the King's Dominions, to be thirty Millions a Year, the Profit of one Month is two Millions and Half, which, added to the above, makes five Millions eighty Thousand Pounds Advantage yearly to the Nation, by the Discovery of the *Longitude*, if the foregoing Suppositions are true. But were it but one tenth Part, 'twould be worthy of a public Consideration.

There is an Act of the twelfth Year of Queen *Anne*, providing a public Reward

ward for the Discovery of the *Longitude* at Sea, and for encouraging any Improvements of Navigation, under certain Commissioners (who are difficult to be brought to a Meeting); and that what I have laid down here may appear to be agreeable to the Sense the Parliament had of the Importance of such Discovery, I shall conclude with the Preamble, and some other Parts of it.

The Acts says:

WHEREAS it is well known by all that are acquainted with the Art of Navigation, that Nothing is so much wanted and desired at Sea, as the Discovery of the *Longitude*, for the Safety and Quickness of Voyages, the Preservation of Ships, and the Lives of Men: And whereas in the Judgment of able Mathematicians and Navigators, several Methods have already been discovered, true in Theory, tho' very difficult in Practice, some of which (there is Reason to expect) may be capable of Improvement, some already discovered, may be proposed to the Public, and others may

' may be invented hereafter; and where-
 ' as such a Discovery would be of par-
 ' ticular Advantage to the Trade of
 ' *Great Britain*, and very much for the
 ' Honour of this Kingdom; but besides
 ' the great Difficulty of the Theory it-
 ' self, partly for the Want of some pub-
 ' lic Reward to be settled as an Encou-
 ' ragement for so useful and beneficial
 ' a Work, and partly for Want of Mo-
 ' ney for Trials and Experiments, ne-
 ' cessary thereunto, no such Inventions
 ' or Proposals hitherto made, have been
 ' brought to Perfection, &c.

And to give Encouragement to the
 Improvement of Navigation in general
 (after specifying Rewards of twenty,
 fifteen and ten Thousand Pounds for
 the Discovery of the *Longitude*, the Act
 says:

' That, if any Proposal shall not, on
 ' Trial, be found of so great Use as a-
 ' forementioned, yet if the same, on
 ' Trial, in the Judgment of the said
 ' Commissioners, or the major Part of
 ' them, be found of considerable Use to
 ' the Public, That then in such Case,
 ' the

' the said Author or Authors, their Exe-
 ' cutors, Administrators, or Assigns, shall
 ' have or receive such less Reward thereof,
 ' as the said Commissioners, or the ma-
 ' jor Part of them shall think reasonable.



A LETTER

the said Author or Authors, their Exe-
 cutors, Administrators, or Assigns, shall
 have or receive such less Reward thereof,
 as the said Commissioners, or the ma-
 jor Part of them shall think reasonable.



A LETTER



A
LETTER
TO THE
ROYAL SOCIETY.

GENTLEMEN,



Have sent you herewith
some Methods for the
Improvement of Na-
vigation: As your Stu-
dies cannot be better
directed, than towards
such Discoveries in Na-
ture, which at the same Time as they
edify the Understanding, do a Service
E to

(26)
to Mankind, or to the Interest and Honour of your Country, so, I flatter myself, any Speculations of that Kind cannot be unacceptable to you : I chuse rather the Honour of communicating these to you, because it is presumed, that, among you are Persons the best acquainted of any in the Kingdom with the Arts and Sciences they relate to ; and, as all human Judgment is fallible, and, what seems the Face of Truth, often proves only a Mask, and also, what escapes the Notice of one Man, may be observed among a Number ; therefore, if there be any Error or Insufficiency in this Work, I may expect to be informed of it from your learned Body ; and, I flatter myself, some worthy Members will not think it too much Trouble to examine it, since it is a Part of your Royal Institution, to promote the Advancement of Arts and Sciences, and all useful Knowledge ; and, if they make any Objections to what I have proposed, I hope they will not be kept private ; for it would be natural to conclude from Silence an Approbation ; as likewise, when a Work
of

of this Kind has obtained yours, that
it must be as good as the Approbation
of the whole Nation, since you are looked
upon to be composed of the choicest
Geniuses in it.

I am,

Your most humble

Servant,

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A



*A Method for finding how
fast a Ship goes, and her
true Course at any Time,
and in any Weather, not-
withstanding Tides, Lee-
ways, and other Difficul-
ties.*



Round Ball of Lead, of
fourteen Pounds, or as
much as shall be found
necessary, is to be fastened
to the End of a Line
fifty or sixty Fathom
long, and thrown over the Stern of the
Ship into the Sea, the other End being
fastened at the Stern.

The

The Uses of it.

1. When a Ship moves, the Line will strain; and which Way soever the Line lies, that is the true Course and Direction of the Ship's Motion; and the Ball sinking below all Tides and Currents, is not affected by them, but preserves its true Direction like a Compass: The Benefit of knowing a Ship's true Course, especially near Land, where Ships are frequently baffled and deceived by Tides, and thereby often lost, every Seaman and Coaster is sensible of.

2. The same Instrument shews what Way a Ship makes, or how fast she goes; and this is to be done, by observing how high or low the Position of the Line is from a level or perpendicular; for the faster the Ship goes, the higher the Ball will be raised, and the slower she goes the nearer will the Line come to a perpendicular.

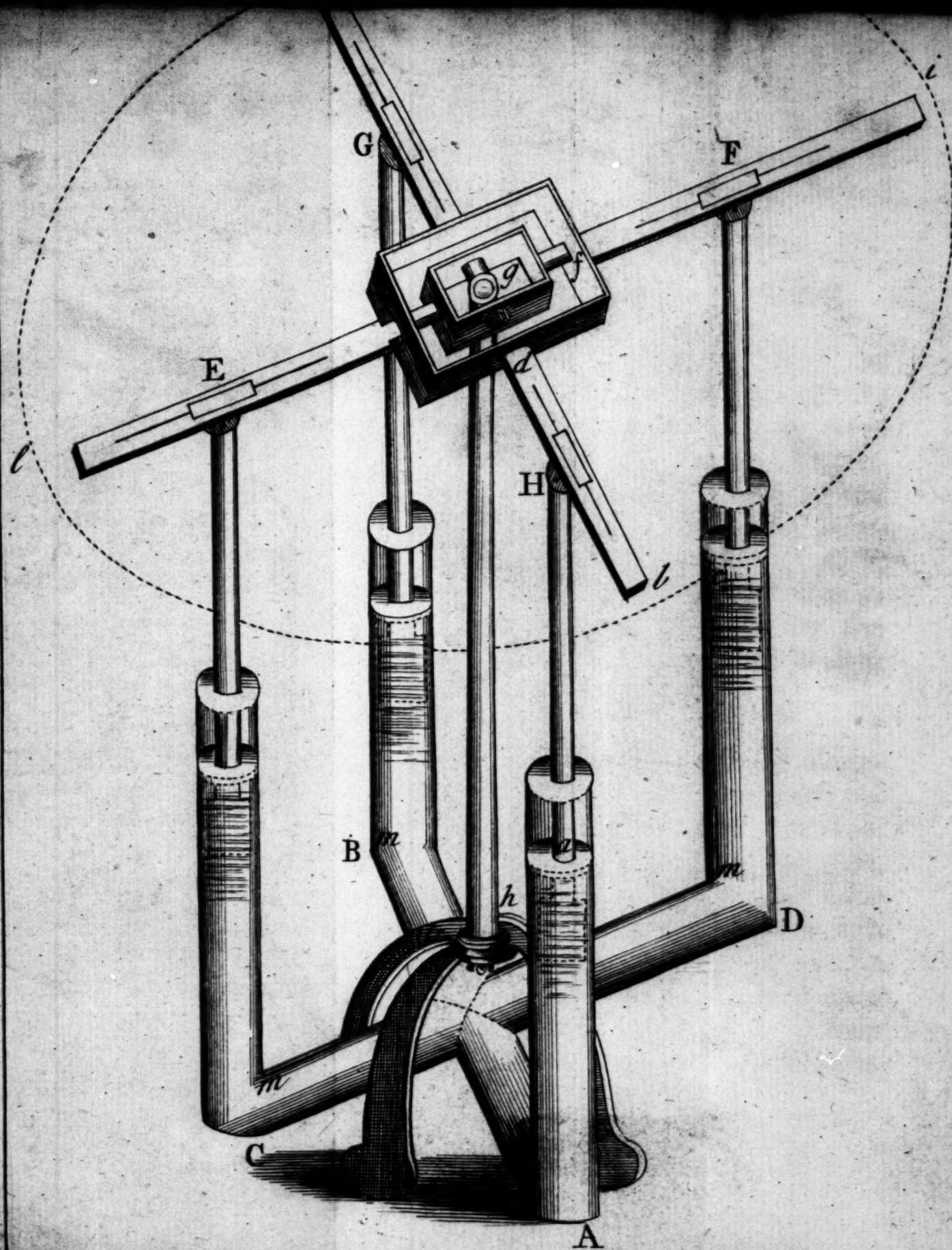
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This Slope or Inclination of the Line may be observed by a Sea Quadrant, or by such an Instrument as is described hereafter.

To find a Ship's Way or Motion.

WHEN the Inclination of the Line is known, I refer to two Methods; the first is, to have Tables calculated for it from Experiments, and Rules laid down by natural Philosophers; and if Sir *Isaac Newton's* Works may be depended upon, there is a sure Method in them, of calculating how fast a Ship goes, having the Inclination of the Line, and the Weight and Magnitude of the Ball.

The other Method is, to have Experiments made in a River, or near the Coasts, where can be had some certain Means of knowing how fast a Ship goes, and to mark what Inclination the Line has from a Motion of one eighth of a Mile in an Hour, to ten or twelve Miles; by these Means a Table may be made for all Balls of a certain Weight



Weight and Bulk, to all Degrees of a Ship's Motion.

If these two Things were known to an Exactness, that is, a Ship's Course, and how fast she goes, the *Latitude* and *Longitude* would both, by Rules in the Art of Navigation, be found without any other Means: Therefore, if this Proposal succeeds, it will accomplish those valuable Purposes of knowing exactly where a Ship is at any Hour in the Day, and in all Kinds of Weather, which is far preferable to any Methods deduced from Observations of the Heavens, they being rendered uncertain by the Weather.

The Description of an Instrument, that will always keep an horizontal Position, notwithstanding the Tossings, and all other Motions of a Ship, by which the Latitude may be found by Observation, as often as desired; the Longitude likewise by Observation, and many other useful Purposes served.

AB is a Tube, about three Inches wide, that holds Water: In the Inside
of

of it, at a , is a little Box of Wood that is born up by the Water, the Rod aH is fastened to it at a , and the other End, at H , fastened to a little Ruler that slides between b and d ; the other Side $CDE F$ is contrived in the same Manner; the Tube CD , stands right a-cross the other, and has a Communication with it at the Interfection; the Beam GH moves, like that of a Scale, upon the other Beam EF at e and f ; and the Beam EF moves as a Scale on an Axis fastened to the Top of the Pillar g ; at m are Appertures.

It may be presently conceived, that the Surfaces of the Water in the Ends A and B , C and D , will be level, and, of Consequence, the Boxes a and x , and the Beam CD , by them is made level; the other Beam is likewise always kept level in the reverse Position; so that, if $bikl$ was a Table or Plane, it would be always level, whatever Motion the Ship had; for this Machine will always come to its horizontal Position, without shaking

shaking, or vibrating, as a Weight will,
that is hanging.

Its Uses.

1. Placing the Compass upon the Level, will keep it quite steady, and enable a Man to steer to a greater Exactness than they do now.
2. To put a Minute or Hour Glass upon it, it will go much truer, by being always upright.
3. To take an Observation when the Horizon is obscure, and likewise in the Night Time to take the Altitude of the Stars, in Order to find the *Latitude*.
4. By placing an Azimuth Compass upon this Level, the Variation would be readily observed, as would likewise the Sun's Altitude and Azimuth, or its Amplitude, by which the *Latitude* would be found; and these are Things of very great Importance to Navigation in the Safety of Ships, and Quickness of Voyages; for if the Compass be wrong, every body knows the ill

Consequences of it ; and knowing the *Latitude* frequently is a Direction to them to steer in the shortest Course, and clear of all Dangers. It is a Custom in most Ships to find their *Latitude* by only one Method, which is the Altitude of the Sun, when it is in the Meridian, because they have no certain Method for doing it by any other Observations ; so that, if the Sun shines all the Morning and Afternoon, and is obscured at Noon, they lose their Observation ; or, if the Sun appears at Noon, and the Horizon is not clear, it is the same Thing ; so that a Ship shall be a Week, sometimes a Fortnight, without an Observation ; by which Disappointment many a Ship has been lost ; but by these Means, as there are but few Days but the Sun appears sometime or other, so whenever that is, the *Latitude* may be found.

5. A Machine may be contrived from this Instrument to hold a Person in a moveable Frame always upright, so as to take Observations, which are now not practicable. Some there are, particularly the Eclipses of the Satellites of the Planet *Jupiter*,

Jupiter, that require only the Use of a long Telescope at Sea, to find the *Longitude*, which may be done in such a Machine.

6. The Inclination of the Line in the former Proposal, may be readily observed by this Instrument, and it will be of great Help to the other likewise, by its finding the *Latitude* frequently by Observations; for that will discover the Truth or Error of the Reckoning by the Line and Ball; and, if there be an Error, by that of the *Latitude* may be corrected that of the *Longitude*; for the Error in the *Longitude* must be proportionable to that of the *Latitude*; and if you have a Ship's true Course or several Courses, and the Proportion of the Distances sailed in each Course, one to the other, when you find your true *Latitude*, your true *Longitude* may be thereby found.

Thus have I ventured forth these Contrivances, which are the Effects of Amusement rather than of the Hopes of Advantage to myself. As they are easy, and if they should, in a greater or lesser Degree,

gree, prove successful, the Expence of 'em
to a Ship would be very small, and like-
wise, as they are no new tedious and
difficult Practices, but rather a Help or
Improvement to the old Art of Naviga-
tion, I thought no Kind of Proposals for
the Ends designed, could be more ac-
ceptable to Seamen. If I find them fa-
vourably looked upon, it will encourage
me to disclose some other Things I have
had sometime by me, designed for the
Benefit of Navigation, which (as well as
these here published) should they prove
imperfect, may have their Deficiencies
perhaps supplied by some other Hand.

F I N I S.

